Crisis in Paradise: Understanding the Household Conservation Response to California's 2001 Energy Crisis

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ABSTRACT

Conventional energy policy wisdom treats consumer demand for household energy as relatively inelastic. Behavior change in regards to energy use is seen as rare and resisted, and post-conservation "snap-back" is to be expected. This view reinforces twenty years of generally modest support for household energy conservation/efficiency programs in the U.S. In California during 2001, all of this changed. Large-scale conservation marketing campaigns accompanied by financial incentives were directed at residential consumers, who also experienced price increases, threats of rolling blackouts, and widespread media coverage of the political turmoil and uncertainty surrounding the energy supply system. Consumers reacted with a dramatic conservation response. By June of 2001, household consumption in the state's two largest utility service territories had declined by 10-12% over the previous year and a reduced level of consumption continued throughout the summer.

This paper examines these consumer responses in detail, drawing on data from a comprehensive study of household conservation action in California conducted during the state's 2001 energy crisis. Combining responses from detailed surveys with data from billing records, we are able to explore how different consumer groups did (and didn't) act to conserve energy. Findings on how their actions were reflected in actual consumption changes are discussed, as are the influences upon consumer choice of news coverage, social networks, marketing efforts, price increases, blackouts, and conservation programs.

Introduction

From the fall of 2000 through late summer of 2001, the state of California experienced an energy supply crisis on a scale not seen in the United States since the late 1970s. Earlier energy crises had resulted from fossil fuel shortages (and rising prices), but the integrity and reliability of the electricity grid had never really been in danger. However, in California during 2000-2001, system capacity emergencies were common. Blackouts occurred sporadically (and at times when they weren't expected) early in the period, and were predicted to be frequent throughout the summer—although they failed to materialize as a result of conservation response by energy users and a Federal freeze on wholesale electricity prices. Yet prior to the summer, there were very real and widespread concerns about the potential for economic disruption and threats to personal health and safety (e.g., failure of traffic control systems, elevators, hospital backups, and the provision of cooling to vulnerable populations).

As a result, a wide range of state-sponsored programs were initiated to reduce demand and buffer economic and social systems from serious damage. A number of state agencies

placed on emergency status to implement these programs. One of these, the California Energy Commission (CEC), also recognized that the crisis presented a unique opportunity to gather information about conservation decision-making that could ultimately lead to improved policy development, program design and demand forecasting. As a result, the CEC commissioned a detailed evaluation of California consumer response during the summer of 2001 and beyond. That research has focused on the actions of residential, business, government, and agricultural consumers. Some of the first results of the residential sector research are reported here.

Methodology and Data Sources

The data used in this analysis were acquired from California consumers and major utility companies. A telephone survey of approximately 1860 randomly selected residential electricity consumers was conducted during the months of September and October of 2001. By this time, all of these consumers had experienced a variety of energy crisis conditions. These included: (1) continuous coverage in the print and broadcast media of the evolving crisis (including the workings of an erratic wholesale electricity market, political debates over federal and state roles and responsibilities, utility bankruptcy, state purchase of power on behalf of utilities, and stories about energy conservers and cases of energy waste), (2) rolling blackouts, (3) pleas for conservation from public officials, (4) state and utility advertising campaigns aimed at promoting conservation and offering a variety of financial incentives, and (5) rising electricity prices at the retail level. These conditions varied across California utility territories, with the most serious threats and uncertainties being faced by the customers of investor-owned utilities (IOUs).

The survey sample was stratified by utility territory, with interviews of between 200 and 600 households conducted in each of the five major California utility service territories (e.g., of the Pacific Gas and Electric Company, Southern California Edison, San Diego Gas and Electric, Los Angeles Department of Water and Power, and the Sacramento Municipal Utility District). The smaller utilities were over-sampled in order to allow statistical comparisons with the larger utilities in subsequent analysis.

Following a detailed literature review and construction of an extensive bank of previously tested survey questions, a sampling frame was constructed from utility customer accounts and random phone number samples, assuring that all households in the five utility territories were equally likely to be selected. Phone interviews were then conducted that lasted between 20 and 30 minutes, with respondents providing detailed information on their energy-related concerns, conservation actions, motivations, sources of influence, likelihood of continuing conservation practices, plans for future energy efficiency investments, experience with blackouts, price increases and public programs, policy attitudes and views, housing characteristics, major appliances, and household demographics.

Many questions were open-ended. For example, we asked respondents whether they had “made any changes in energy use” and, if so, “what those changes were,” rather than eliciting responses from lists of possible conservation actions, and thereby reducing the risks of a “priming” effect that would result in an over-reporting of behaviors. We gathered data on a variety of other topics in the same manner, including open-ended questions about conservation/efficiency actions planned for the future, knowledge of conservation programs,

and views of state policies needed to continue the conservation response. The resulting responses from the interviewees' own points of view and in their "native language" were then categorized and coded for analysis in combination with the pre-coded responses to close-ended questions. We also collected data on household energy use before, during and after the 2000-2001 crisis episode, along with weather data from key weather stations in the various utility territories. Detailed analyses of those data are in progress. While our energy savings impact analyses are not reported here, some preliminary observations about energy savings have been made (Lutzenhiser 2002a), and these are briefly described in this paper.

At the time of this writing, the study is in an exploratory phase in which broad patterns of consumer response are being mapped and questions regarding differences between subgroups of respondents are posed. The exploratory analysis to date has included: (1) examination of the distributions of attitude, behavior, socio-demographic, and housing/technology variables, (2) correlation studies of relationships between variables, (3) combining and scaling variables, and (4) multi-variate modeling using log-linear, logit and ordinary least squares regression approaches.

Findings

Our findings fall roughly into five categories. These include: overall consumer concerns, conservation response, specific conservation actions taken (by whom), general motivations and sources of influence, and the likely effects upon consumers of prices, blackouts, and efficiency programs. For the analysis reported here, the sample is weighted to reflect the actual distribution of the population within three primary housing types (single family detached, multi-family, and mobile homes) within each utility territory. Each utility is, therefore, represented in the weighted sample in proportion to its share of all California residential consumer households. These proportions are show in Table 1.

Table 1. Utility Population Shares: State of California

Utility	Weighted Sample Proportion (%)
Pacific Gas and Electric (PG&E)	39.1
Southern California Edison (SCE)	35.6
Los Angeles Dept. of Water & Power (LADWP)	11.5
San Diego Gas and Electric (SDG&E)	9.7
Sacramento Municipal Utility District (SMUD)	4.0
Total	100.0

Concerns about Energy and Need for Conservation

A vast majority of those surveyed reported concerns about the energy situation and expressed a willingness to actively reduce their own consumption. In response to the question "Since the beginning of the year, how much have you been thinking about the effects of the energy situation on you, your family or friends," about 80 percent said either "a lot" (48%) or "some" (32%). About 79 percent reported that they had made changes in their energy use in response to the crisis. Of the 21 percent who told us that they had made *no changes*, most (66%) believed that their energy use was already low. Only a very small

number reported that they were either not aware of how to make changes to reduce their energy use (5%) or didn't see any reason to change (9%).

A solid majority (57%) volunteered suggestions of "other things that you would like to see government do that would encourage or enable you to save energy or be more efficient" (responses included support for rebates, tax credits, public education, investment in renewables, and a variety of other suggestions). And a similar proportion (59%) said that Californians must "make real changes in their lifestyles in order for the state's energy problems to be solved," (compared to 33 percent who believe that "Californians can retain their lifestyle and the state's energy problems can still be solved"—a position that, ironically, can be held both by strong energy efficiency advocates, as well as those who might be unconcerned about energy-related economic and environmental problems).

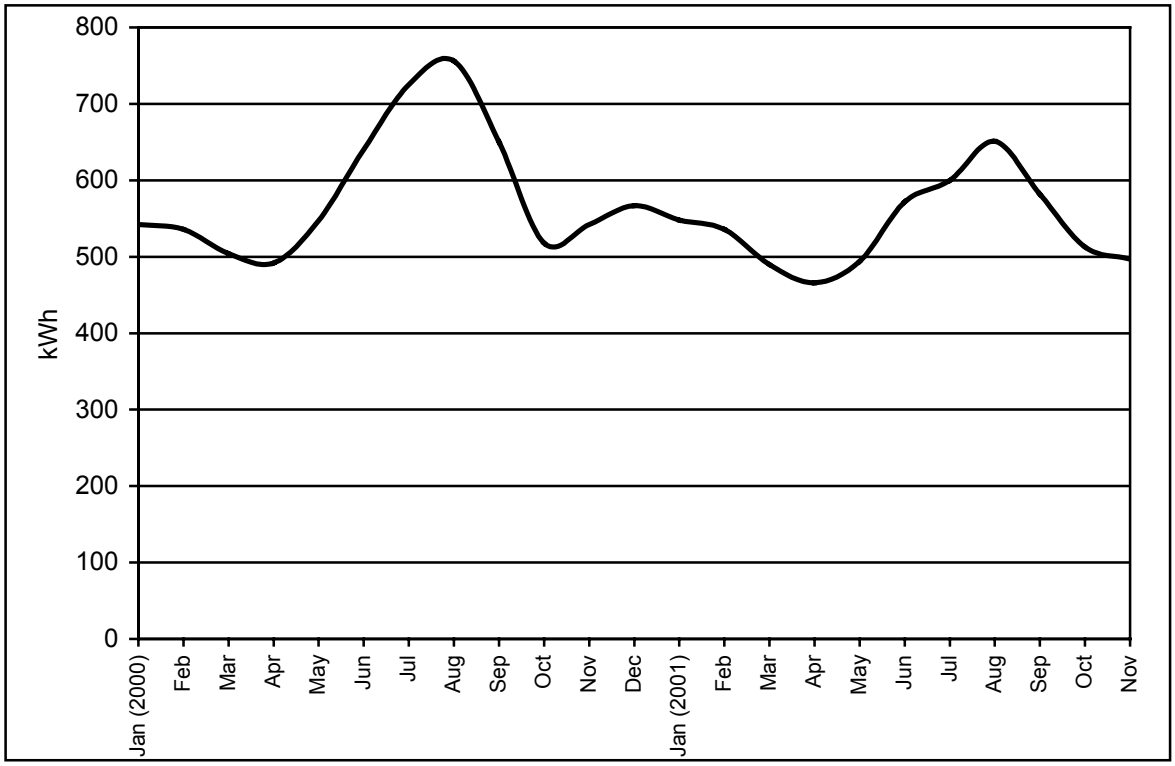
From the survey, we can see that Californians had been and continued to be concerned about energy in the fall of 2001, despite the "solution" offered by the Federal cap on wholesale prices several months before. Also, their views were serious and engaged, and they were willing to shoulder responsibility for addressing collective energy problems by taking individual conservation actions. In short, their level of concern and engagement were far from what the stereotyped view of a self-indulgent and blasé Californian would predict. And because citizens of the state of California are among the most efficient users of energy in the U.S. (CEC 2002), their willingness to conserve and actual savings realized are even more interesting.

Conservation Response

In fact, the changes in energy use that resulted from Californians' concerns and reactions to the crisis were striking. Across all sectors, conservation actions and changes in peak demand resulted in significant reductions in both overall electricity use and peak demand (CEC 2002). Figure 1 illustrates the point by showing the changes in average monthly electricity use in a sample of Southern California Edison residential consumers.

From the figure, we can see that the normal seasonal pattern of lowest usage in the late fall and early spring, with increasing demands in the summer (for cooling) and during the winter (for heating and lighting), is repeated, *but at much lower levels*, both during and *after* the crisis period. It turns out that the weather was quite similar during the two years shown, and comparisons with 1999 as well as more sophisticated analyses of the relationships between temperature and consumption during the entire 1999-2001 period show that the consumption patterns of 2001 are significantly different from those of the previous (1999-2000) period, and evidence a significantly modified relationship between weather and demand in the later period (Woods 2002). We reiterate that speculations about milder temperatures during the crisis period are not supported by empirical analysis of official weather data collected from across the state.

Figure 1. Changing Patterns of Residential Electricity Use, Average kWh per Month in 2000 and 2001: Southern California Edison



In effect, the crisis represents a "natural experiment" that helps us better understand just how much energy is actually required to "power" a society—and how health, wealth and comfort are affected by voluntary conservation and reduced levels of consumption. The research reported here is not designed to chronicle those effects in detail, and certainly not across all sectors and end-uses. However, we have been able to determine that a range of fairly simple and effective conservation actions seem easily adopted in the residential sector. It is certainly not clear at this point whether "crisis" conditions are necessary to stimulate such actions. But we have found that they can be pursued by persons as a matter of routine, with low levels of complaint or concern about lifestyle erosion.

Conservation actions taken (and by whom). The open-ended survey questions about actions taken in response to the crisis yielded an average of 2.4 conservation changes each for the 79 percent households reporting such actions (termed the "conserver" households below). An initial typology was developed that classified the responses into about 70 different conservation behavior types. For the present analysis, these have been grouped into eleven categories which are listed in Table 2, along with the shorthand variable names used in the further analyses reported below.

Table 2. Behaviors Reported in 11 Categories

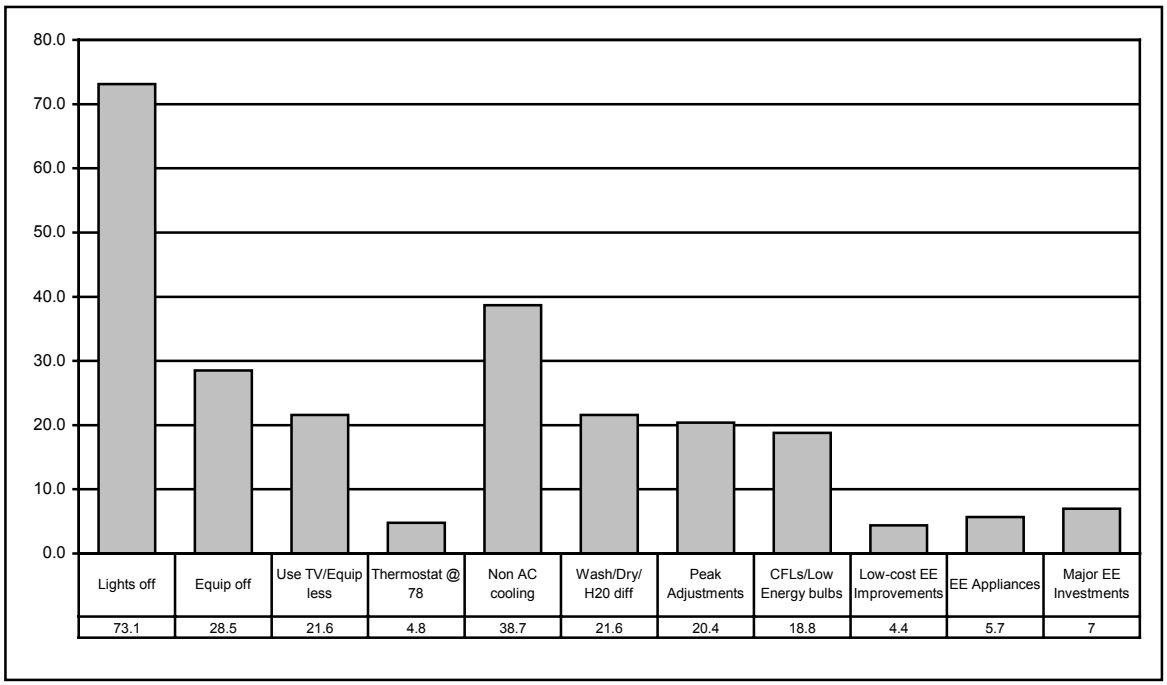
Variable name	Description
Lights	Turn off lights or use fewer lights
TV	Turn off television or watch less television
Equip Off	Turn off equipment when not in use (including less pool & hot tub use)
TST 78	Raise air conditioner thermostat setting to 78 degrees or above
Non AC	Use the air conditioner less often or not at all
Wash/Dry	Wash or dry clothes less frequently, use a clothesline instead of dryer, wash dishes less frequently
Peak Adj	Use less energy during off-peak hours and/or shift specific energy uses to off-peak hours
CFL/bulb	Install compact florescent bulbs or other energy saving/low-watt bulbs
LC EE	Make low cost investments (install fans, plant trees, add awnings, service air conditioner, purchase evaporative cooler, add timers or motion detectors)
EE Apps	Purchase energy-efficient appliances
Maj EE	Make major efficiency investments (whole house fan, solar panels, add insulation, purchase new or energy-efficient air conditioner)

As shown in Figure 2, some of these actions were fairly common (e.g., turning off lights was reported by 73% of the conserver households), while others were relatively rare (e.g., reports of making investments in more efficient appliances and equipment). Figure 3 shows the relative distribution of conservation actions. Setting thermostats at 78 degrees and higher, a behavior targeted by pro-conservation advertising, was reported in only about 4 percent of the households (about 7% of households with central air conditioning). However, nearly 40 percent of households either chose not to use air conditioning (AC) at all, or to use it more sparingly. Also, altering washing and drying patterns, shifting energy use to off system peak hours in the late afternoon, and installing compact florescent lamps and other "low energy" bulbs were reported in each case by about 20 percent of the sample. Finally, efficiency investments that ranged from installing ceiling fans, to buying ENERGYSTAR™ appliances, to investing in new windows, insulation and/or solar systems were reported by small minorities of households (4-7% in each case).

The efficacy of these various conservation strategies can be debated, and further analysis remains to determine how they might be associated with reductions in consumption by households in the sample. However, some actions clearly yield grater savings than others. Turning off even a half-dozen 75-Watt bulbs clearly saves less energy than not turning on a 1500-2000 Watt air conditioner.

The question of whether particular actions were taken in combination with others has been investigated in only a preliminary way. However, correlation analysis indicates statistically significant, but not terribly strong, associations between (1) lights off + television off + thermostat higher + non AC use + peak adjustments, (2) television off + wash/dry differently, (3) non AC + peak adjustments, and finally (4) the investment behaviors: low-cost efficiency investment + efficient appliance purchase + major investments in efficiency. Further analysis is underway to determine how significant this clustering of behaviors might be.

Figure 2. Self-reported Conservation Actions Taken by California Households



In an effort to determine whether different *demographic* subgroups of consumers (i.e., "market segments") pursued different conservation strategies, a series of logistic regressions were performed on dummy/binary variables (i.e., coded 1 = target behavior reported, or 0 = behavior not reported) for each of the eleven behavior types. In the resulting models, a number of significant socio-demographic associations were identified. In each case, the coefficients represent either an increased or decreased likelihood that particular consumer subgroups engaged in the target behavior, while *controlling for the simultaneous effects of the other variables in the model.* This means that we can be confident that an effect associated with Hispanic ethnicity, for example, is not really an income or home ownership effect (to the degree that those factors might be higher or lower among Hispanic consumers). The results of this analysis are reported in Table 3.

Education level is not associated with any target behavior, and the effects of income are small and contradictory, with a greater likelihood of shutting off equipment such as pool pumps as income increases (as well as the likelihood of actually having a pool pump), but a lower likelihood of not using AC or reporting using it less. Hispanic households are more likely to report turning off the television, making peak adjustments, and making major efficiency investments than whites (the reference category). However, they are less likely to report changes in washing and drying patterns. African American households are more likely than Whites to report turning off the television, and both African Americans and Asian/Other households are more likely to purchase high efficiency light bulbs.

As age increases, there is a lower likelihood of turning off lights or making peak adjustments, but a greater likelihood of changing washing/drying practices and buying more efficient lights bulbs. Single adults and single adult-headed households were more likely to turn off television and lights respectively, but both singles and couples are less likely than couples with children (the reference category) to report a variety of other behaviors.

Table 3. Logistic Regression Models for Selected Dependent Variables

Independent Variables	*Dependent Variables*				
	Lights	**TV**	**Equip Off**	**Non AC**	**Wash/Dry**
Education	—	—	—	—	—
Income	—	—	0.004*	-0.003*	-0.006**
Ethnicity[1]					
Hispanic	—	0.578**	—	—	-0.699*
African American	1.078**	—	—	—	—
Asian/Other	—	—	—	—	—
Age	-0.011**	—	—	—	0.014*
Household Composition[2]					
Single	—	0.52*	-0.404*	-0.816***	—
Single with kids	0.497*	—	—	—	—
Couple	—	—	—	—	-0.71**
Dwelling Type[3]					
Multi-Family	—	-0.554**	—	—	-0.562*
Mobile Home	—	—	—	0.573*	—
Owns home	-0.404**	-0.668**	—	0.482**	—
Square Feet (000s)	—	—	—	—	—
Constant	0.797	-1.623	-0.559	-0.709	-1.978
Independent Variables	**Peak Adj**	**CFL blb**	**LC EE**	**EE Apps**	**Maj EE**
Education	—	—	—	—	—
Income	—	—	—	—	—
Ethnicity[1]					
Hispanic	0.454*	—	—	—	0.825**
African American	—	0.893**	—	—	—
Asian/Other	—	0.525*	—	—	—
Age	-0.026**	0.015*	—	—	—
Household Composition[2]					
Single	-0.654**	-1.316***	—	—	—
Single with kids	—	—	—	—	—
Couple	—	-0.607**	—	—	—
Dwelling Type[3]					
Multi-Family	—	—	-1.355**	—	—
Mobile Home	1.048**	1.027**	1.559**	—	—
Owns home	—	—	—	1.693**	—
Square Feet (000s)	—	0.221**	—	—	—
Constant	-0.994	-3.174	-2.917	-4.387	-3.463

* $p < .10$; ** $p < .05$; *** $p < .001$

[1] For Ethnicity, White is the omitted category

[2] For Household Composition, Couple with Kids is the omitted category

[3] For Dwelling Type, Single-Family residence is the omitted category

Occupants of multi-family housing were less likely than those living in single family detached units (the reference group) to report turning off the TV, changing washing/drying patterns, or, making low-cost efficiency investments. The latter is hardly surprising, since even in owner-occupied attached dwellings, the opportunities to install even simple equipment may be quite limited. Mobile home residents, on the other hand, were more likely

to report making low-cost efficiency investments, as well as non-use or less use of AC, peak adjustments, and CFL purchase. Home ownership is also associated with low-cost efficiency upgrades, as well as lower AC use. However, homeowners were proportionately less likely to report turning off lights and/or to turn off the television. Finally, house size was significantly associated with only one behavior: CFL purchase. As dwelling size increases, all other factors being equal, the likelihood of occupants installing higher efficiency lighting also increases.

These findings show a markedly mixed picture of conservation action. Most of those surveyed reported taking some sort of action. However, the proportions of households reporting each particular action are fairly small (from 4-20% of the sample in most cases). The exceptions are turning off lights (probably a fairly insignificant effort in energy terms), and turning off the air conditioner (probably a highly important effort). Also, as just described, the logit analysis shows that some socio-demographic groups were more likely than others to pursue particular conservation strategies.

Impacts on energy use. An obvious question would be "What, if any, energy savings resulted from these actions?" While detailed analysis of utility billing information is in process, preliminary investigation of consumption data from the Southern California Edison territory (Lutzenhiser 2002a) suggests that when electricity use in the early summer of 2001 is compared with consumption in the previous year by the same households, about 67 percent of the sample did save some energy as a result of their actions. However, only about 30 percent saved at least 20%—the threshold for award of "20/20" benefits from the state (households who used at least 20% less than they did in 2000 received a credit equal to 20% of their bill for the month). This relatively small group of customers also seems to have been responsible for the vast majority (about 75%) of total savings. It is possible that some conservers who saved relatively little on a monthly basis contributed more than others to *peak savings*. However, we do not have time-of-use data for our sample and, therefore, cannot explore that possibility.

Motivations and Sources of Influence

Table 4 shows that, among those who indicated that they had made changes in their energy use in response to the crisis, five motivations were most likely to be considered *very important*. These were: "keeping electricity bills down" (76%), "doing your part ..." (69%), "trying to avoid blackouts" (77%), "using energy resources wisely" (78%), and "to stop energy suppliers from overcharging" (79%). These responses indicate a mixture of economic self-interest, civic and other-regarding motives, as well as widespread agreement with the notion that exploitative energy pricing was a key cause of the crisis (e.g., as opposed to "under-building" of power plants, or simple "problems of supply and demand," which were also widely circulated explanations at the time). Although slightly less widely held, concern for environmental protection was also reported to be "very important," by a large majority (70%). At the same time, "qualifying for a utility rebate," was seen as the least important reason for conservation (and was the motivation most likely to be reported by consumers [about 32%] to be "unimportant").

Table 4. Percent Reporting Various Reasons as Important Motivations for the Conservation of Energy (Weighted Frequencies, n=1586)

	Very Important	Somewhat Important	Unimportant
To keep electricity bills down	76.5	20.4	3.1
To qualify for a utility rebate	33.4	34.9	31.7
To do your part to help Californians through a difficult time	69.1	23.6	7.3
To try to avoid blackouts	76.8	15.8	7.4
To use energy resources wisely as possible	77.9	18.8	3.3
To protect the environment	70.4	21.0	8.6
To stop energy suppliers from overcharging	78.8	12.8	8.4

Once the conserver is concerned and motivated—as the overwhelming majority of those surveyed clearly were—the remaining crucial factors shaping action are his/her *knowledge* and *capacity to act* (Lutzenhiser 2002b). One has to know how to act effectively, and one must be in a position to take effective action. An analysis of the *influences* of various information (knowledge) sources indicates that these may vary a good deal in their effects upon consumers' conservation choices and actions. Table 5 reports these results.

News stories on television are seen by a large minority of consumers (44%) to be a "major influence." However, social networks (which have been identified as important sources of influence on conservation behavior [e.g., Black, Stern & Elworth 1985]), seem much less influential. About half of the respondents said that their friends, neighbors and coworkers had had "no influence" on their conservation actions/choices. Follow up questions about whether persons believed that they were, in fact, conserving "more," "less" or "about the same" as others, provided "don't know" responses much of the time (53% regarding family members, 46% for friends, and 63% for coworkers). Conservation doesn't seem to be water cooler talk.

Education programs at school and information from community groups were also reported to be less influential than other sources, with 59% in each case saying that these have "no influence." However, it is also important to note that 35 percent of the sample did say that these sources had some influence. The lack of significant influence of *websites* in this sample is also notable. Only 10 percent said that internet sources were a "major influence," and 63 percent said that the web either had "no influence" or was "never used." Finally, more than 80 percent of the respondents saw "common sense" and "their own past experience" as major influences, suggesting that many conservation alternatives are seen as obvious things that one *could* do, but may choose for one reason or another not to. Our analysis of influences and significant sources of knowledge and information continues, with examination of patterns of influence across different subgroups of consumers, and of the connections between sources of influence, actions taken, and actual consumption change (if any).

Table 5. Sources of Influence on Energy Conservation Decisions and Actions (Percent Reporting, Weighted Frequencies, n=1586)

	Major Influence	Minor Influence	No Influence	Never Use This
Information included in utility bill	21.1	44.9	33.1	0.9
Suggestions by friends or neighbors	10.7	37.6	50.4	1.4
Things suggested by co-workers	9.7	30.1	51.4	8.8
News stories on television	44.1	34.5	20.4	1.0
Advertisements on television	30.9	37.8	30.0	1.3
Information from the radio	24.3	37.4	35.4	2.9
Information from world-wide web	9.7	27.7	54.0	8.6
Education programs from a school	14.2	19.1	59.4	7.3
Information from community groups	11.8	24.3	59.2	4.7
Product rebates related to conservation	20.7	35.5	41.4	2.4
Recommendations of bldg contractors	11.5	20.0	63.2	5.3
Past experience or common sense	83.3	13.2	3.4	0.1

In addition to concern and knowledge, the third ingredient of conservation action is the capacity *to act*—i.e., having the latitude to take action, particularly in the case of efficiency hardware investments. Different consumers are constrained in different ways by such things as the availability of products in the market, access to financing, the realities of how their dwellings are designed, constructed, and oriented, and a host of other factors (see Lutzenhiser 2002b for a more thorough discussion of real-world efficiency choice). When survey respondents were asked if they planned further conservation actions, about 48% said that they would like to make specific efficiency investments. But when asked about impediments to action (e.g., access to trusted contractors, lack of technical expertise, financing, etc.), the overwhelming majority also volunteered that "price," "cost," "lack of money," or "financial considerations" were limiting factors. It is clear that further research is required to determine whether typical utility rebate levels are sufficient to address these perceived cost barriers.

Significance of Price, Blackouts, and Efficiency Programs

In addition to the macro conditions (politics, uncertainties) and proximate influences (media, utility information, social networks) on conservation that have already been discussed, persons also might be expected to be encouraged to conserve by price increases, blackouts, and state and/or utility-sponsored incentive programs. A key interest of our research has been to sort out the effects of these various "drivers" of consumer action, and that effort continues.

In terms of price impacts on consumers, residents in three of the five utility service territories had, in fact, experienced some rate increases during the crisis (although, because of "baseline" rate blocks, many consumers who used little energy experienced no rate increases). The investor-owned utilities and the municipal utilities had, in each case, somewhat different supply, market exposure, debt, and income circumstances—which were reflected in their different residential rates and rate increases. Across all utilities, however, a majority of survey respondents said that price increases (or potential price increases) either had "a lot" (40%) or "some" (27%) effect on their decisions to conserve energy. At the same

time, about 32 percent said that price increases had had "little" or "no influence" on their actions (and a number of these were also "conserver" households).

Because "price signals" to consumers can only have effect if they are noticed, we were curious about how persons actually "interacted" with their energy bills. While 62 percent of those surveyed reported that they spent some time looking over their monthly utility bills, the balance (about 38%) said that they either "pay the bill and don't bother to pay any attention to it" or that don't see the bill because they aren't the household member responsible for paying it.

Recall that blackouts were expected to be a significant source of concern and motivation for taking conservation action. About 32 percent of the sample had indeed experienced a system-ordered blackout at some time during the previous year. Of this group, 24 percent said that their blackout experiences had been "very inconvenient." However, the balance saw them either as "minor inconveniences" (63%) or were "not inconvenienced at all" (13%).

Respondents saw state-sponsored programs as something good, important and that should be continued, with about 85 percent volunteering suggestions for further government action. However, awareness of *particular* programs available in their locales was very limited. Only 26 percent of those surveyed were able to identify *any* such programs in open-ended questioning, and only 29 percent of that group (or 7% of the total sample) reported participating in those programs. Definitional ambiguities about what is meant by "program" may play a part in this finding, although low levels of awareness and participation should not be surprising, given the limited number of programs historically available to residential consumers, the hardware efficiency focus of most programs, and the short time for ramp-up of new initiatives in 2001. Also, most state-sponsored programs were focused on peak load reductions, and many involved only the largest energy users—the commercial, industrial and agricultural customers (see CEC 2002 for an overview of program offerings).

Conclusion

Californians showed remarkable resilience and willingness to make changes in their energy use in response to the uncertainties and threats of the 2001 energy supply crisis. They reported commitments to continue their current conservation practices, and expressed their willingness to do more, if necessary.

Many of the conservation actions they reported could be said to be "easy." They did not discomfort consumers or threaten their quality of life. However, other actions (e.g., using no AC or using it sparingly), fall in a category of more "difficult" actions that conventional energy policy wisdom would expect consumers to be quite unwilling to even consider on the grounds of comfort and convenience. It is likely that the "alternative cooling" (or "rethinking cooling") households were actually responsible for a very significant share of conservation benefits—although that can only be determined by analyses that are currently underway.

The major point is that the use of cooling seems to be something that can be more carefully controlled—with significant effect and perhaps a minimum of discomfort and indignity. Only 20 percent of the respondents said, in fact, that there were any conservation actions they had heard of (e.g., using a clothesline) that they were completely unwilling to do. And one group (about 17% of the sample) said that the crisis and their conservation

experiences had "possibly improved" their quality of life. So the California 2001 "natural experiment" has shown considerably more flexibility and adaptability than energy policy analysts and program planners had imagined, with observed changes in behavior and reductions in demand that would have been unthinkable to system managers or load forecasters only a year or so before. It is true that a "crisis" condition was required to stimulate these changes. So the expectation of behavioral "snap back" or return to old habits is likely widespread in energy circles. Only time will tell. But the California 2001 crisis did demonstrate surprising elasticity of response that energy planners and managers should now take into account.

Despite the impressive conservation results in California, it is also the case that a minority of households probably contributed the bulk of the conservation gains. And even with widespread social marketing efforts, efficiency program offerings, price increases, and blackouts, the importance attributed to these events and interventions was lower than expected. So it is apparently not the case that high levels of concern, commitment, exposure to information, and actual efforts to conserve are sufficient to produce a significant conservation effect in the majority of the population.

With further analysis of our survey, billing and weather data, and follow-up surveys with the sample households during the summer of 2002, we hope to shed light on the real world conditions, considerations and constraints that shape what people can and will actually do. A key question for this research has been from the outset, "Who did what and why?" (Matthews 2001). The results reported here offer some initial answers, finding that lots of people did lots of things (for lots of reasons), with likely quite mixed effects. There are patterns of response, however, and insights about consumer behavior, policies and programs that can be explicated even at this early stage of the analysis.

As important, a series of new and interesting questions have also been raised that we hope can be addressed more thoroughly in the coming phases of the research. These include: "Why in the world did *anyone* conserve?" "Why did some persons conserve at such high levels (and with such significant effects), when it was easy to do very little?" And, the flip-side of these questions, "Why weren't significant actions and effects more widespread in the residential sector, in light of the seriousness of the problem, a high degree of consensus about the need for energy savings and demand reduction, and a constant barrage of media messages, threats and interventions aimed at inducing conservation?" The answers to these questions will undoubtedly also be part of a mixed bag. For example, since California is already nearly the most energy efficient state in the union, there may not be all that much more conservation to be had by the most vigorous efforts. But if that's true, how was a minority of typical Californians able to do so much, on such short notice?

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